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YELLOWSTONE RIVER COMPACT COMMISSION

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THIRTY-FIRST ANNUAL REPORT

1982

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YELLOWSTONE RIVER
COMPACT COMMISSION
THIRTY-FIRST ANNUAL REPORT
1982

YELLOWSTONE RIVER COMPACT COMMISSION

821 East Interstate Avenue
Bismarck, North Dakota

Honorable Ed Herschler
Governor of the State of Wyoming
Cheyenne, Wyoming

Honorable Ted Schwinden
Governor of the State of Montana
Helena, Montana

Honorable Allen I. Olson
Governor of the State of North Dakota
Bismarck, North Dakota

Sirs:

Pursuant to Article III of the Yellowstone River Compact, the Commission submits the following thirty-first annual report of activities for the period ending September 30, 1982.

The Commission held the annual meeting at Billings, Montana, on November 10, 1982. Mr. George L. Christopulos, Wyoming State Engineer, Mr. Gary Fritz, Administrator, Water Resources Division, Montana Department of Natural Resources and Conservation, the designated representatives of their respective States, and Mr. L. Grady Moore, the designated Federal representative and chairman, were all present.

Others present were:

George M. Pike, U.S. Geological Survey, WRD, Helena, Montana,
Richard Moy, Montana Department of Natural Resources and
Conservation, Helena, Montana,
Paul Kawulok, Wyoming Board of Control, Story, Wyoming,
Paul Schwieger, Wyoming State Engineer's Office, Cheyenne,
Wyoming,
Lawrence Wolfe, Wyoming Attorney General's Office, Cheyenne,
Wyoming,
David A. Sprynczynatyk, North Dakota State Water Commission,
Bismarck, North Dakota,
Tom Asay, Montana State Representative, Forsyth, Montana,
John Buyok, Wyoming State Engineer's Office, Cheyenne,
Wyoming,
David Palmerlee, Sheridan-Little Horn Water Group, Sheridan,
Wyoming,
Orrin Ferris, HKM Associates, Billings, Montana, representing
Crow Tribe,
A. T. Kersich, HKM Associates, Billings, Montana, represent-
ing Crow Tribe,

William R. Jones, Attorney for Wyoming, Wheatland, Wyoming,
Harry Roberts, Wyoming Heritage Society, Cody, Wyoming,
David B. Fuller, Fuller Ranch Co., Parkman, Wyoming,
Charles F. Fuller, Fuller Ranch Co., Wyola, Montana,
Dan Ashenberg, Montana Department of Natural Resources and
Conservation, Helena, Montana,
Richard Feltis, U.S. Geological Survey, WRD, Billings,
Montana,
Ray Hankins, Wheatland, Wyoming,
Craig Cooper, Board of Control, Division III, Riverton,
Wyoming,
Lou Allen, Wyoming State Engineer's Office, Cheyenne, Wy-
oming,
Michelle Johnston, U.S. Geological Survey, WRD, Helena,
Montana

The Commission held a special meeting at Billings, Montana, on April 26, 1982. Mr. George L. Christopulos, Wyoming State Engineer, Mr. Gary Fritz, Administrator, Water Resources Division, Montana Department of Natural Resources and Conservation, the designated representatives of their respective States, and Mr. L. Grady Moore, the designated Federal representative and Chairman, were all present.

Others present were:

John Buyok, Wyoming State Engineer's Office, Cheyenne, Wy-
oming,
Lou Allen, Wyoming State Engineer's Office, Cheyenne, Wyoming,
Paul Kawulok, Wyoming State Engineer's Office, Cheyenne,
Wyoming,
Lawrence Wolfe, Wyoming Attorney General's Office, Cheyenne,
Wyoming,
Paul Schwieger, Wyoming State Engineer's Office, Cheyenne,
Wyoming,
Ted Meredith, U.S. Department of the Interior, Solicitor's
Office, Billings, Montana,
Gerhard Knudsen, Montana Department of Natural Resources
and Conservation, Helena, Montana,
George Pike, U.S. Geological Survey, WRD, Helena, Montana,
David F. Palmerlee, Attorney, Sheridan-Little Horn Water
Group, Buffalo, Wyoming,
Richard Moy, Montana Department of Natural Resources and Con-
servation, Helena, Montana,
Rich Brasch, Montana Department of Natural Resources and
Conservation, Helena, Montana,
Thomas Acevedo, Attorney, Boulder, Colorado, representing
Crow Tribe,
Orrin Ferris, HKM Associates, Billings, Montana, representing
Crow Tribe,
Norris "Mack" Cole, U.S. Bureau of Indian Affairs, Billings,
Montana,

Bob Lane, Montana Department of Natural Resources and Conservation, Helena, Montana,
David Ladd, Montana Department of Natural Resources and Conservation, Helena, Montana,
Cal Wilson, Busby, Montana,
David A. Sprynczynatyk, North Dakota State Water Commission, Bismarck, North Dakota,
Ray Two Two, Northern Cheyenne Tribe, Lame Deer, Montana,
Tom Asay, Montana State Representative, Forsyth, Montana,
David B. Fuller, Fuller Ranch Co., Parkman, Wyoming,
Charles F. Fuller, Fuller Ranch Co., Wyola, Montana,
Jeanne Whiteing, Attorney, Native American Rights Fund, Boulder, Colorado,
Rick Devore, U.S. Bureau of Reclamation, Billings, Montana

The April 26 special meeting was called to formulate approaches to study the Little Bighorn and Tongue Rivers. A technical committee was appointed to begin studies of the Little Bighorn River. This committee is to provide the background information for negotiating a compact. Montana and Wyoming have not agreed as to whether the Little Bighorn agreement would be formulated into a new compact or included in the Yellowstone River Compact. Another technical committee was formed to determine and agree on the storable inflows to the Tongue River Dam that Montana is entitled to under the Yellowstone River Compact. Montana is attempting to enlarge the existing hazardous structure to satisfy existing irrigators and provide enough water to resolve the reserved water rights question on the Northern Cheyenne Reservation.

Montana voiced its concern that during low-flow years Wyoming needs to regulate its post-1950 water rights more carefully so that Montana can use its pre-1950 water. Montana, in turn, must notify Wyoming when it is not able to obtain its pre-1950 water. A situation developed during the spring of 1981 in which Montana was almost unable to fill the Tongue River Reservoir even though it has a pre-1950 water right.

Flows on the tributaries of the Yellowstone River were generally high enough so as not to require administration by the Commission in accordance with the provisions of the Compact. However, the Commission feels that an administrative process must be developed in the very near future because of the many competing demands for Yellowstone River water. The Commission hopes that the studies on the Tongue River will soon lead to an agreement on the administrative process needed in this basin.

Discussions were held on the need to document pre- and post-1950 water rights. Wyoming has completed its adjudication of pre-1950 water. Montana, however, is still in the process of adjudicating its water rights. The period for claiming pre-1973 water rights closed April 1982 and the Montana Water Courts are in the process of putting together the preliminary decrees. The Commission

discussed the importance of having accurate data on both pre- and post-1950 water rights.

A question that has concerned the Commission involves the quantification of Indian Federal Reserved Water Rights and how these rights are to be treated by the Commission. Montana contends that Indian Reserved Water Rights are excluded from the Compact because of Articles V and VI. Wyoming, however, purports that Indian Reserved Water Rights comes out of the State's share in which the reservation is located. Wyoming is presently adjudicating the reserved water rights of the Shoshone and Arapahoe Tribes in the Bighorn Basin of Wyoming. The special water master will make a decision in the near future. Montana, through the Reserved Water Rights Compact Commission, is negotiating with the Northern Cheyenne and Crow Tribes. The Commission has until 1985 to negotiate compacts.

The Little Bighorn Technical Committee reported that a base accounting model (OPSTUDY) has been developed by Montana for the river. The model has been sent to Wyoming and all interested parties for review and modifications. Wyoming indicated that Governor Herschler will appoint a Wyoming negotiating commission in the spring of 1983. Wyoming has recently signed a contract with an instate legal firm to develop a strategy for negotiations on the Little Bighorn.

The basic methodology for determining Montana's share on the Tongue River has been developed. Discussions are continuing between Montana and Wyoming regarding refinements in the methodology and the assumptions used.

The Commission discussed in considerable detail the Jan Paul application (Yellowstone Pipeline Company). This is a water right filed in 1979 in Montana that would divert 348 ft³/s or 251,952 acre-feet per year from the Yellowstone main stream near the confluence of the Yellowstone and Powder Rivers. The water would be transported to a storage facility near Sheridan, Wyoming, and used for coal slurry, industrial, and other purposes. This water right application has raised the following issues:

1. Whether the priority date of the application falls under Wyoming's or Montana's adjudication system.
2. Can the water be used for coal slurry purposes because coal slurry is a nonbeneficial use in Montana?
3. Does Article X apply?
4. If the water comes from Wyoming's share under the Compact, which tributary(s) does it come from and how will it be administered?

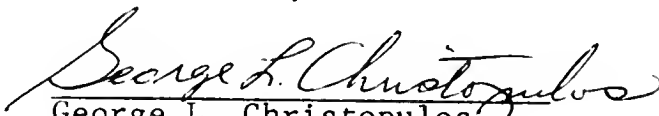
The recent decision by the U.S. Supreme Court letting stand a decision by the Montana Supreme Court in Utah International vs. Intake Water Company was discussed. The Montana Supreme Court upheld a district court ruling that the Montana Department of Natural Resources and Conservation acted properly in assigning Utah International an earlier priority date on its water right application than that of Intake Water Company. Other legal issues that were discussed included:

1. Intake Water Co. vs. Yellowstone River Compact Commission
2. Montana Senate Bill 243, which delegates the authority to the Montana Department of Natural Resources and Conservation to approve diversions from the Yellowstone River Basin. The first approval by the Montana Department of Natural Resources and Conservation must be ratified by the Montana Legislature.


Another issue addressed by the Commission is diversions of water in Wyoming for use in Montana. At this time Montana and Wyoming have identified the following diversions in the Clarks Fork Basin: Chance Allen, Doctor, Sirrine and Interstate Ditches. The Commission decided to determine whether other ditches needed to be included in this list and then make a decision on them all. Montana and Wyoming would both like to resolve this issue in the near future.

The last item of discussion involved the relationship between the Yellowstone River Compact and the developing conflict on the Missouri River between the upper and lower Missouri Basin States. The Commission feels that any negotiated resolution of the Missouri River conflict must take into account the existence of the Yellowstone River Compact. The Compact already divides all the unused and appropriated water of this river and its tributaries between the three States.

The budgets for fiscal years 1983 through 1984 are discussed in the following general report. The amount of funds required for future Commission activities will depend largely on the outcome of water-development plans, inflation, and the degree of water administration required.


George L. Christopoulos
Commissioner for Wyoming


Gary Fritze
Commissioner for Montana


L. Grady Moore
Federal Representative

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GENERAL REPORT

Cost of operation and budget

The work funded by the Commission, which to date has been primarily concerned with the collection of required hydrologic data, has been financed through cooperative arrangements whereby Montana and Wyoming each bear one-fourth of the cost and the remaining one-half is borne by the United States. The salaries and necessary expenses of the State and Federal representatives, and hydrologic data made available by other agencies, are not evaluated or considered as expenses of the Commission.

The expense of the Commission during fiscal year 1982 was \$30,800, in accordance with the budget adopted for the year.

The budgets for fiscal years 1983 and 1984 were tentatively adopted subject to the availability of appropriations.

The budgets for the three fiscal years are summarized as follows:

October 1, 1981, to September 30, 1982 (fiscal year 1982):

Continuation of existing stream-gaging programs \$30,800

October 1, 1982, to September 30, 1983 (fiscal year 1983):

Continuation of existing stream-gaging programs \$31,120

October 1, 1983, to September 30, 1984 (fiscal year 1984):

Estimate for continuation of existing stream-gaging programs \$29,720

Stream-gaging-station operation

Gaging stations at the measuring sites specified in the Compact were continued in operation and satisfactory discharge records collected at each. The streamflow station near the mouth of the Bighorn River, formally published as Bighorn River at Bighorn, Mont., was moved 2.3 miles (3.7 km) upstream to facilitate better record collection. Henceforth, the name of the new gaging station is Bighorn River above Tullock Creek, near Bighorn, Mont. Locations of gaging and reservoir stations are shown on a map of the Yellowstone River Basin at the end of the report.

During the water year ending September 30, 1982, annual streamflow was below average in three of the four tributaries of the Yellowstone River as given in the following table:

<u>Measurement point</u>	<u>Percent of average</u>
Clarks Fork Yellowstone River near Silesia, Mont.	106
Bighorn River above Tullock Creek, near Bighorn, minus Little Bighorn River near Hardin, Mont. Adjusted for change in contents in Bighorn Lake	95
Tongue River at Miles City, Mont.	68
Powder River near Locate, Mont.	71

Details of streamflow for water year 1982 and bar graphs showing comparisons with average flows during selected base periods and with the preceding year are given in the section "Monthly summary of discharge for Compact stream-gaging stations."

Diversions

No incidents during the year required administration of the water in accordance with the provisions of the Compact. At the present level of water-resources development, the Commission believes that a program of intensive water-use regulations is not necessary.

Storage in reservoirs

Reservoirs completed after January 1, 1950

Bighorn Lake, a U.S. Bureau of Reclamation project on the Bighorn River, and the largest storage project in the basin, contained 1,036,000 acre-feet at the beginning of the year and 1,043,000 acre-feet at the close. It fluctuated from a minimum of 724,400 acre-feet on April 26, 1982, to a maximum of 1,099,000 acre-feet on August 11, 1982. Boysen Reservoir, located on the Wind River and operated by the U.S. Bureau of Reclamation, began the year with 653,000 acre-feet in storage and ended with 746,700 acre-feet. Details regarding these reservoirs are given in the section "Monthly summary of contents for Compact reservoirs completed after January 1, 1950." The Commission is cognizant of other reservoirs in this general group and considers their aggregate effect to be insufficient to warrant the collection of storage data at this time.

Reservoirs existing on January 1, 1950

As a matter of record and general information, month-end storage data are given later in the report for reservoirs in existence upstream from the points of measurement on January 1, 1950. These data are pertinent to allocation under Article V, Section C, Item 5 of the Compact.

MONTHLY SUMMARY OF DISCHARGE FOR COMPACT STREAM-GAGING STATIONS

06208800 Clarks Fork Yellowstone River near Silesia, Mont.

LOCATION.--Lat 45°30'48", long 108°49'42", in NW1/4 SE1/4 sec. 1, T. 4 S., R. 23 E., Carbon County, Hydrologic Unit 10070006, on left bank 0.5 mi (0.8 km) downstream from Whitehorse Canal intake, 1 mi (2 km) upstream from Rock Creek, 3 mi (5 km) south of Silesia, and at mile 16.3 (26.2 km).

DRAINAGE AREA.--2,093 mi² (5,421 km²).

PERIOD OF RECORD.--October 1969 to current year. Records for July 1921 to September 1969 (published as Clarks Fork Yellowstone River at Edgar) at site 5.8 mi (9.3 km) upstream not equivalent owing to diversion in Whitehorse Canal during irrigation season. Records since January 1950 available in annual reports of Yellowstone River Compact Commission.

GAGE.--Water-stage recorder. Datum of gage is 3,405.79 ft (1,038.085 m) National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers).

REMARKS.--Records good except those for winter period and June 21 to Sept. 30, which are poor. Diversion for irrigation of about 45,900 acres (186 km²), revised, of which 2,180 acres (8.82 km²), revised, lies below station. In addition, about 56,200 acres (227 m²), revised, of land above station are irrigated by diversions from the adjoining Rock Creek basin.

AVERAGE DISCHARGE.--13 years, 1,197 ft³/s (33.90 m³/s), 867,200 acre-ft/yr (1.07 km³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,500 ft³/s (382 m³/s) June 10, 1981, gage height, 8.36 ft (2.548 m); minimum, 56 ft³/s (1.59 m³/s) Apr. 25, 1981, gage height, 0.53 ft (0.162 m).

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 5,300 ft³/s (150 m³/s) and maximums (*):






Date	Time	Discharge		Gage height	
		(ft ³ /s)	(m ³ /s)	(ft)	(m)
May 28	2200	5,400	153	5.07	1.545
June 29	--	*10,400	295	*8.09	2.466

Minimum daily discharge, 220 ft³/s (6.23 m³/s) Jan. 22, result of freezeup.

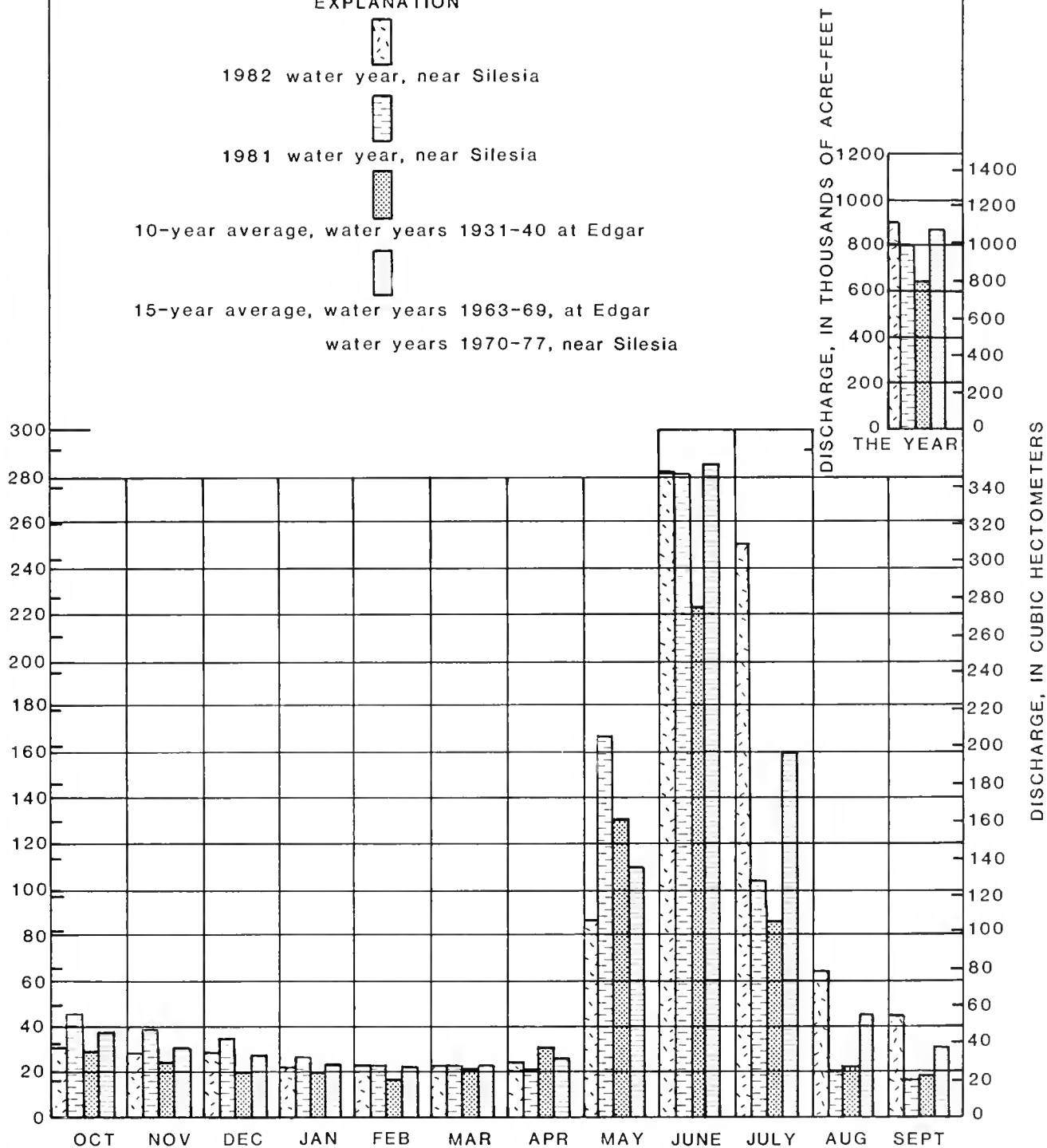
Month	Second-foot days	Mean	Maximum	Minimum	Runoff, in acre-feet
October 1981	15,397	497	561	370	30,540
November	14,712	490	519	429	29,180
December	14,804	478	634	340	29,360
January 1982	11,410	368	520	220	22,630
February	11,857	423	600	230	23,520
March	11,846	382	404	354	23,500
April	12,338	411	662	325	24,470
May	44,263	1,428	4,800	398	87,800
June	142,710	4,757	9,200	1,580	283,100
July	126,400	4,077	7,600	1,900	250,700
August	32,750	1,056	1,800	720	64,960
September 1982	23,480	783	1,300	340	46,570
1982 water year	461,967	1,266	9,200	220	916,300

CLARKS FORK YELLOWSTONE RIVER NEAR SILESIA, MONT.
(Replaces Clarks Fork Yellowstone River at Edgar)

EXPLANATION

-  1982 water year, near Silesia
-  1981 water year, near Silesia
-  10-year average, water years 1931-40 at Edgar
-  15-year average, water years 1963-69, at Edgar
-  water years 1970-77, near Silesia

DISCHARGE, IN THOUSANDS OF ACRE-FOOT



Comparison of discharge during 1982 water year with 1981 water year near Silesia and with average discharge for water years 1931-40 at Edgar and for water years 1963-69 at Edgar and 1970-77 near Silesia.

06294000 Little Bighorn River near Hardin, Mont.

LOCATION.--Lat 45°44'09", long 107°33'24", in SE1/4 NE1/4 NE1/4 sec. 19, T. 1 S., R. 34 E., Big Horn County, Hydrologic Unit 10080016, on left bank 50 ft (15 m) downstream from bridge on Sarpy Road, 0.2 mi (0.3 km) upstream from terminal wasteway of Agency Canal, 0.6 mi (1.0 km) upstream from mouth, and 2.3 mi (3.7 km) east of Hardin.

DRAINAGE AREA.--1,294 mi² (3,351 km²).

PERIOD OF RECORD.--June 1953 to current year. Records since June 1953 available in annual reports of Yellowstone River Compact Commission.

GAGE.--Water-stage recorder. Datum of gage is 2,882.29 ft (878.522 m) National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Oct. 7, 1953, nonrecording gage at site 0.4 mi (0.6 km) downstream. Oct. 7, 1953, to May 6, 1963, water-stage recorder at site 0.3 mi (0.5 km) downstream. May 6, 1963, to Nov. 6, 1963, nonrecording gage at site 0.4 mi (0.6 km) downstream. All at different datums. Nov. 7, 1963, to Aug. 15, 1976, water-stage recorder at site 35 ft (11 m) downstream at present datum. Aug. 15, 1976, to Sept. 30, 1979, water-stage recorders located on each bank downstream of Sarpy Road bridge and were used depending on control conditions.

REMARKS.--Records fair except those for winter period, which are poor. Flow partly regulated by Willow Creek Reservoir (capacity 23,000 acre-ft, 28.4 hm³). Diversions for irrigation of 20,980 acres (84.9 km²), revised, above station. Figures of discharge given herein include flow of terminal wasteway of Agency Canal.

AVERAGE DISCHARGE.--29 years, 316 ft³/s (8.949 m³/s), 228,900 acre-ft/yr (282 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 22,600 ft³/s (640 m³/s), May 19, 1978, gage height, 11.20 ft (3.414 m), used gage height as obtained at bridge on Sarpy Road; maximum gage height, 11.78 ft (3.591 m) Mar. 20, 1960, site and datum then in use (backwater from ice); minimum discharge observed, 0.20 ft³/s (0.006 m³/s) Aug. 7, 1961, result of discharge measurement.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 1,000 ft³/s (28.3 m³/s) and maximums (*):

Date	Time	Discharge (ft ³ /s) (m ³ /s)		Gage height (ft) (m)	
Feb. 18	1700	--	--	*9.17	2.795
Feb. 19	--	a 1,100	31.2	--	--
June 16	0700	* 1,190	33.7	3.95	1.204

a daily discharge

Minimum daily discharge, 60 ft³/s (1.70 m³/s) Jan. 23.

Month	Second-foot days	Mean	Maximum	Minimum	Runoff, in acre-feet
October 1981	4,754	153	180	115	9,430
November	4,334	144	161	100	8,600
December	4,328	140	191	75	8,580
January 1982	3,270	105	180	60	6,490
February	8,265	295	1,100	65	16,390
March	6,604	213	349	150	13,100
April	6,479	216	355	158	12,850
May	8,523	275	527	165	16,910
June	21,876	729	1,140	328	43,390
July	11,795	380	811	162	23,400
August	3,615	117	179	80	7,170
September 1982	4,004	133	241	60	7,940
1982 water year	87,847	241	1,140	60	174,200

06294500 Bighorn River above Tullock Creek, near Bighorn, Mont.

LOCATION.--Lat 46°07'29", long 107°28'06", in SE1/4 SE1/4 NE1/4 sec. 3, T. 4 N., R. 34 E., Treasure County, Hydrologic Unit 10080015, on right bank, 1.9 mi (3.1 km) upstream from Tullock Creek, 3.0 mi (4.8 km) upstream from mouth, 3.6 mi (5.8 km) southwest of Bighorn, and 4.5 mi (7.2 km) southeast of Custer.

DRAINAGE AREA.--22,414 mi² (58,052 km²). Area at site used Oct. 7, 1955, to Sept. 30, 1981, 22,885 mi² (59,272 km²).

PERIOD OF RECORD.--Oct. 1, 1981, to Sept. 30, 1982. Records since January 1950 available in annual reports of the Yellowstone River Compact Commission. Previously, published as "06294700 Bighorn River at Bighorn, MT," 1956-81, and as "near Custer," 1945-55. Flows are equivalent at all sites.

GAGE.--Water-stage recorder. Altitude of gage is 2,700 ft (823 m), from topographic map. May 11 to Dec. 6, 1945, nonrecording gage, and Dec. 7, 1945, to Oct. 6, 1955, water-stage recorder at different datum. Oct. 7, 1955, to Sept. 30, 1981, at site 2.3 mi (3.7 km) downstream at different datum.

REMARKS.--Records good except those for winter period, which are poor. Flow regulated by Bighorn Lake beginning November 1965 (usable capacity, 1,356,000 acre-ft, 1.67 km³). Major regulation prior to November 1965 by 14 reservoirs in Wyoming and 1 in Montana with combined usable capacity of about 1,400,000 acre-ft (1.73 km³), see sections "Monthly summary of contents for Compact reservoirs." Diversions for irrigation of about 445,000 acres (1,800 km²) above station.

AVERAGE DISCHARGE.--37 years (water years 1946-81, 1982), 3,914 ft³/s (110.8 m³/s) 2,836,000 acre-ft/yr (3.50 km³/yr), unadjusted.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge, 59,200 ft³/s (1,680 m³/s) May 20, 1978, gage height, 14.15 ft (4.313 m); maximum gage height recorded, 14.21 ft (4.331 m) Apr. 2, 1965 (ice jam); minimum discharge, about 275 ft³/s (7.79 m³/s) Nov. 15, 1959, result of freezeup; minimum daily, 400 ft³/s (11.3 m³/s) Apr. 4, 1967.

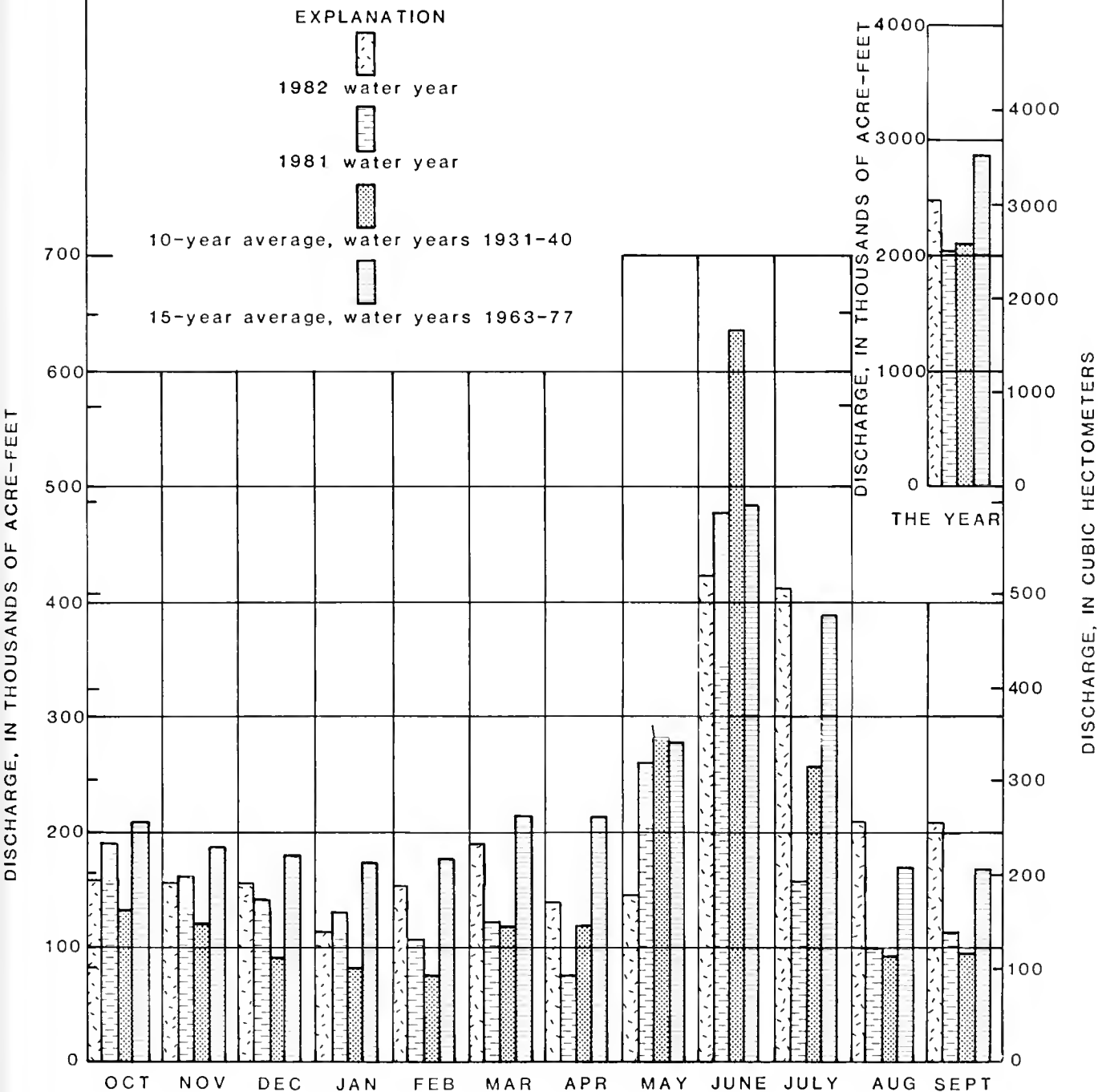
EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,550 ft³/s (185 m³/s) July 5, 1982, gage height, 4.06 ft (1.237 m); maximum gage height, 8.52 ft (2.597 m) Jan. 14, 1982 (ice jam); minimum daily discharge, 1,270 ft³/s (36.0 m³/s) Oct. 17, 1981.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,550 ft³/s (185 m³/s) July 5, gage height, 4.06 ft (1.237 m); maximum gage height, 8.52 ft (2.597 m) Jan. 14 (ice jam); minimum daily discharge, 1,270 ft³/s (36.0 m³/s) Oct. 17.

Month	Second-foot days	Mean	Maximum	Minimum	Runoff, in acre-feet	Adjusted runoff, in acre-feet*
October 1981	83,780	2,703	3,600	1,270	166,200	164,800
November	109,360	3,645	3,740	3,570	216,900	160,400
December	112,660	3,634	3,760	3,200	223,500	159,100
January 1982	100,400	3,239	4,000	2,400	199,100	114,700
February	96,560	3,449	4,520	2,600	191,500	155,400
March	114,890	3,706	4,070	3,150	227,900	191,900
April	113,940	3,798	4,050	3,110	226,000	134,700
May	71,120	2,294	3,100	1,710	141,100	142,700
June	109,850	3,662	4,620	2,140	217,900	422,900
July	176,290	5,687	6,520	4,720	349,700	411,400
August	134,880	4,351	5,160	4,060	267,500	211,300
September 1982	108,390	3,613	4,620	2,910	215,000	210,100
1982 water year	1,332,120	650	6,520	1,270	2,642,000	2,479,400

*Adjusted for change in contents in Bighorn Lake minus Little Bighorn River near Hardin plus Tullock Creek inflows.

BIGHORN RIVER ABOVE TULLOCK CREEK, NEAR BIGHORN, MONT.
 (Adjusted for change in contents in Bighorn Lake
 minus
 Little Bighorn River near Hardin, Mont.
 plus
 Tullock Creek inflows)



Comparison of discharge for 1982 water year with 1981 water year and with average discharge for water years 1931-40 and 1963-77.

06308500 Tongue River at Miles City, Mont.

LOCATION.--Lat 46°20'44", long 105°48'10", in NE1/4 NE1/4 SE1/4 sec. 23, T. 7 N., R. 47 E., Custer County, Hydrologic Unit 10090102, on right bank 4 mi (6 km) south of Miles City and at mile 8.1 (13.0 km).

DRAINAGE AREA.--5,379 mi² (13,932 km²).

PERIOD OF RECORD.--April 1938 to April 1942, April 1946 to current year. Published as "near Miles City" April 1938 to April 1942. Not equivalent to records published as "near Miles City" May 1929 to October 1932. Monthly discharges only for some periods, published in WSP 1309. Records since January 1950 available in annual reports of Yellowstone River Compact Commission.

GAGE.--Water-stage recorder. Datum of gage is 2,375.76 ft (724.132 m) National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). April 1938 to April 1942, nonrecording gage at site 8 mi (13 km) upstream at different datum. April 1946 to Sept. 30, 1963, at datum 1.00 ft (0.305 m) higher.

REMARKS.--Records good except those for winter period, which are poor. Flow regulation by Tongue River Reservoir (see section "Monthly summary of contents for Compact reservoirs existing on January 1, 1950") and many small reservoirs in Wyoming (combined capacity, about 15,000 acre-ft, 18.5 hm³). Diversions for irrigation of about 100,800 acres (408 km²) above station.

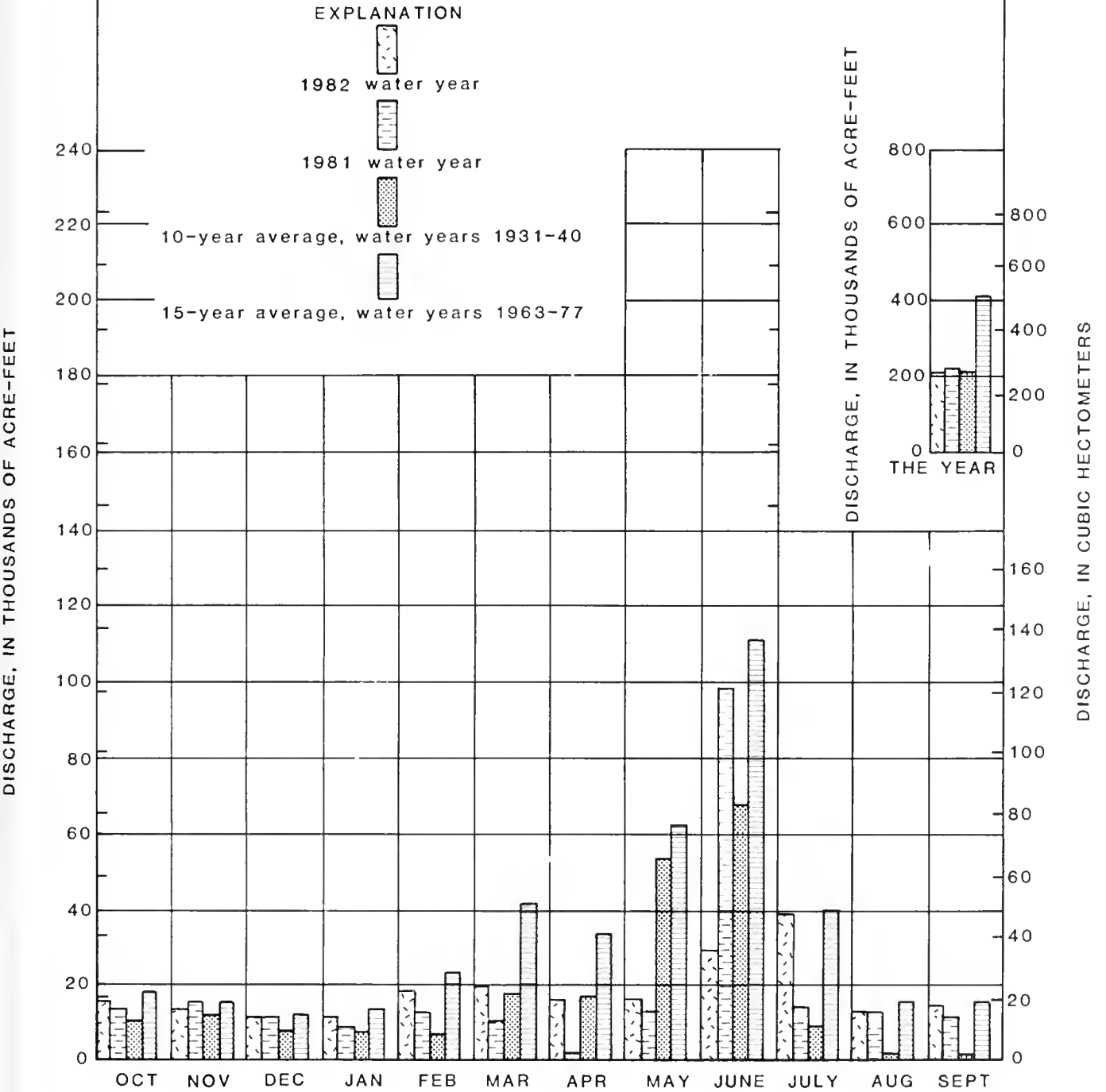
AVERAGE DISCHARGE.--39 years (1938-41, 1946-82), 440 ft³/s (12.46 m³/s), 318,800 acre-ft/yr (393 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,300 ft³/s (337 m³/s) June 15, 1962, gage height, 12.33 ft (3.758 m), present datum, from rating curve extended above 8,220 ft³/s (233 m³/s) on basis of float measurement; maximum gage height, 13.27 ft (4.045 m), Mar. 19, 1960, Feb. 15, 1971 (ice jam), present datum; no flow July 9-19, Aug. 13, 14, Sept. 28, 1940.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,510 ft³/s (42.8 m³/s) July 5, gage height, 4.17 ft (1.271 m); maximum gage height, 10.02 ft (3.054 m) Feb. 21 (backwater from ice jam); minimum daily discharge, 110 ft³/s (3.12 m³/s) Jan. 10, result of freezeup.

<u>Month</u>	<u>Second-foot days</u>	<u>Mean</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Runoff, in acre-feet</u>
October 1981	7,597	245	288	203	15,070
November	6,374	212	233	140	12,640
December	5,950	192	260	130	11,800
January 1982	5,600	181	320	110	11,110
February	9,110	325	700	130	18,070
March	9,862	318	580	163	19,560
April	8,289	276	339	209	16,440
May	8,299	268	575	196	16,460
June	14,213	474	1,040	193	28,190
July	19,711	636	1,500	226	39,100
August	6,342	205	270	176	12,580
September 1982	7,116	237	345	187	14,110
1982 water year	108,463	297	1,500	110	215,100

TONGUE RIVER AT MILES CITY, MONT.



Comparison of discharge for 1982 water year with 1981 water year and with average discharge for water years 1931-40 and 1963-77.

06326500 Powder River near Locate, Mont.

LOCATION (REVISED).--Lat 46°26'56", long 105°18'44", in NW1/4 SW1/4 sec. 14, T. 8 N., R. 51 E., Custer County, Hydrologic Unit 10090209, on left bank 1.5 mi (2.4 km) downstream from bridge on old U.S. Highway 12 at present site of Locate, 1.5 mi (2.4 km) upstream from Locate Creek, 5 mi (8 km) west of former site of Locate, 25 mi (40 km) east of Miles City, and at mile 27.9 (44.9).

DRAINAGE AREA.--13,194 mi² (34,172 km²). Drainage area at site 1.5 (2.4 km) upstream, 13,189 mi² (34,160 km²).

PERIOD OF RECORD.--March 1938 to current year. Records since January 1950 available in annual reports of Yellowstone River Compact Commission.

REVISED RECORDS.--WSP 926: 1939. WSP 1309: 1938-39 (M). WSP 1729: Drainage area.

GAGE (REVISED).--Water-stage recorder. Datum of gage is 2,384.79 ft (726.884 m) National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to July 11, 1947, nonrecording gage at bridge 1.5 mi (2.4 m) upstream, and July 11, 1947, to Sept. 30, 1965, water-stage recorder at site near upstream bridge at different datum. Oct. 1, 1965, to Oct. 4, 1966, nonrecording gage, and Oct. 5, 1966, to Mar. 21, 1978, water-stage recorder at present site and datum. Mar. 22, 1978, to Apr. 23, 1981, water-stage recorder 1.5 (2.4 km) upstream at different datum, Apr. 24 to Aug. 20, 1981, water-stage recorder at present site and datum, and Aug. 21, 1981, to Sept. 30, 1981, water-stage recorder 1.5 mi (2.4 km) upstream at different datum. Effective Oct. 1, 1981, recording and nonrecording gages will be maintained at both the upstream and present gage locations and each site will be employed depending on the water-stage control conditions and for the capability of recording useful gage-height data.

REMARKS.--Records poor. Some regulation by three reservoirs in Wyoming with combined usable capacity of 36,800 acre-ft (45.5 hm³). Diversions for irrigation of about 101,800 acres (412 km²), revised, above station.

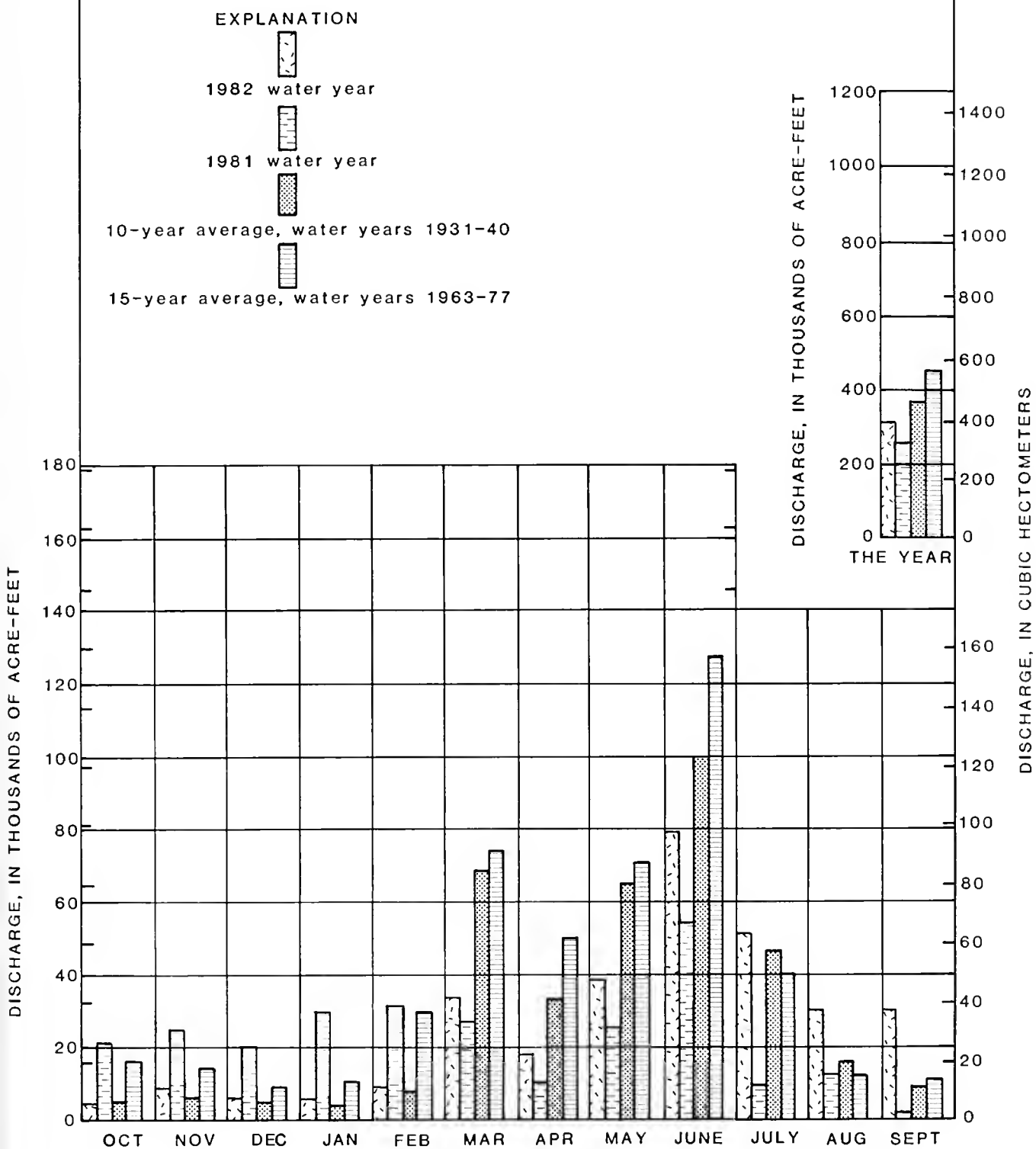
AVERAGE DISCHARGE.--44 years, 614 ft³/s (17.39 m³/s), 444,800 acre-ft/yr (548 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge observed, 31,000 ft³/s (878 m³/s) Feb. 19, 1943, maximum gage height, 12.27 ft (3.740 m) Mar. 16, 1978 (backwater from ice); no flow Jan. 16 to Feb. 12, Feb. 22-24, 1950, July 27, Sept. 21-27, Oct. 1, 1960, Sept. 4-8, 1961.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,100 ft³/s (144 m³/s) June 9, gage height, 5.76 ft (1.756 m), only above base of 5,000 ft³/s (142 m³/s); minimum, 23 ft³/s (0.65 m³/s) Oct. 4, gage height, 1.63 ft (0.497 m).

Month	Second-foot days	Mean	Maximum	Minimum	Runoff, in acre-feet
October 1981	2,637	85.1	155	25	5,230
November	4,528	151	170	80	8,980
December	3,285	106	130	80	6,520
January 1982	3,005	96.9	130	70	5,960
February	4,454	159	500	50	8,830
March	16,942	547	1,400	160	33,600
April	9,459	315	465	220	18,760
May	19,677	635	1,480	188	39,030
June	40,243	1,341	4,070	606	79,820
July	25,715	830	3,040	246	51,010
August	15,126	488	1,700	207	30,000
September 1982	15,057	502	1,740	91	29,870
1982 water year	160,128	439	4,070	25	317,600

POWDER RIVER NEAR LOCATE, MONT.



Comparison of discharge for 1982 water year with 1981 water year and with average discharge for water years 1931-40 and 1963-77.

MONTHLY SUMMARY OF CONTENTS FOR COMPACT RESERVOIRS COMPLETED AFTER JANUARY 1, 1950

06258900 Boysen Reservoir, Wyo.

LOCATION.--Lat 43°25'00", long 108°10'37", in NW1/4 NW1/4 sec. 16, T. 5 N., R. 6 E., Fremont County, Hydrologic Unit 10080005, at dam on Wind River and 13 mi (21 km) north of Shoshoni, Wyoming.

DRAINAGE AREA.--7,700 mi² (19,943 km²).

PERIOD OF RECORD.--October 1951 to current year (monthend contents only).

GAGE.--Water-stage recorder. Datum of gage is referenced to National Geodetic Vertical Datum of 1929 (levels by U.S. Bureau of Reclamation).

REMARKS.--Reservoir is formed by rock-fill dam completed in October 1951. Storage began Oct. 11, 1951. Usable capacity, 742,100 acre-ft (915 hm³) between elevation 4,657.00 ft (1,419.454 m), invert of penstock pipe, and 4,725.00 ft (1,440.180 m), top of spillway gate. Dead storage, 59,880 acre-ft (73.8 hm³) below elevation 4,657.00 ft (1,419.454 m). Prior to Jan. 1, 1966, usable capacity was 757,800 acre-ft (934 hm³) and dead storage was 62,000 acre-ft (76.4 hm³), at same elevations. Crest of dam is at elevation 4,758 ft (1,450 m). Figures given herein represent usable contents. Water used for irrigation, flood control, and power development.

COOPERATION.--Records furnished by U.S. Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily contents, 862,500 acre-ft (1,060 hm³) July 6, 7, 1967, elevation, 4,730.83 ft (1,441.957 m); minimum daily since normal use of water started, 191,900 acre-ft (237 hm³) Mar. 18, 19, 1956, elevation, 4,684.18 ft (1,427.738 m), capacity table then in use.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 749,400 acre-ft (924 hm³) Aug. 2, elevation, 4,725.37 ft (1,440.293 m); minimum, 376,200 acre-ft (464 hm³) May 27, elevation, 4,702.20 ft (1,433.230 m).

<u>Month</u>	<u>Water-surface elevation, in feet</u>	<u>Contents*, in acre-feet</u>	<u>Change in contents, in acre-feet</u>
September 30, 1981.	4,720.25	653,000	
October 31.	4,719.40	637,800	-15,200
November 30	4,717.93	612,000	-25,800
December 31	4,714.64	556,800	-55,200
January 31, 1982.	4,712.90	530,000	-26,800
February 28	4,710.35	490,100	-39,900
March 31.	4,706.14	429,100	-61,000
April 30.	4,702.81	384,100	-45,000
May 31.	4,702.76	383,500	- 600
June 30	4,715.14	565,000	+181,500
July 31	4,725.23	746,700	+181,700
August 31	4,724.98	741,700	- 5,000
September 30, 1982.	4,725.23	746,700	+ 5,000
1982 water year			+93,700

*Does not include dead storage of 59,880 acre-ft (73.8 hm³).

06260300 Anchor Reservoir, Wyo.

LOCATION.--Lat 43°39'50", long 108°49'27", in sec. 26, T. 43 N., R. 100 W., Hot Springs County, Hydrologic Unit 10080007, at dam on South Fork Owl Creek, 2 mi (3 km) downstream from Middle Fork, 3 mi (5 km) southeast of Anchor, and 32 mi (51 km) west of Thermopolis.

DRAINAGE AREA.--131 mi² (339 km²).

PERIOD OF RECORD.--November 1960 to current year (monthend contents only).

GAGE.--Water-stage recorder. Datum of gage is referenced to National Geodetic Vertical Datum of 1929 (U.S. Bureau of Reclamation benchmark).

REMARKS.--Reservoir is formed by concrete arch dam completed in 1960. Usable capacity, 17,170 acre-ft (21.2 hm³) between elevation 6,343.75 ft (1,933.575 m), invert of river outlet, and 6,441.00 ft (1,963.217 m), spillway crest, not including 68 acre-ft (83,800 m³) below elevation 6,343.75 ft (1,933.575 m). Prior to Oct. 1, 1971, usable capacity was 17,280 acre-ft (21.3 hm³) not including 149 acre-ft (184,000 m³) below the invert. Figures given herein represent usable contents. Water is used for irrigation of land in Owl Creek basin.

COOPERATION.--Records furnished by U.S. Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily contents, 9,250 acre-ft (11.4 hm³) July 4, 1967 (elevation, 6,418.52 ft or 1,956.365 m); no storage on many days each year.

EXTREMES FOR CURRENT YEAR.--Maximum daily contents, 783 acre-ft (965,400 m³) June 30, elevation, 6,368.99 ft (1,941.268 m); no storage on many days.

Month	Water-surface elevation, in feet	Contents*, in acre-feet	Change in contents, in acre-feet
September 30, 1981.	* 6,304.30	0	0
October 31.	* 6,304.30	0	0
November 30	* 6,304.30	0	0
December 31	* 6,304.30	0	0
January 31, 1982.	* 6,304.30	0	0
February 28	* 6,304.30	0	0
March 31.	* 6,304.30	0	0
April 30.	6,304.30	0	0
May 31.	6,350.00	80	+ 80
June 30	6,368.99	783	+ 703
July 31	* 6,355.05	188	- 595
August 31	* 6,304.30	0	- 188
September 30, 1982.	* 6,304.30	0	0
1982 water year			0

*Does not include dead storage of 68 acre-ft (83,800 m³).

06286400 Bighorn Lake near St. Xavier, Mont.

LOCATION.--Lat 45°18'27", long 107°57'26", in SW1/4 SE1/4 sec. 18, T. 6 S., R. 31 E., Big Horn County, Hydrologic Unit 10080010, in block 13 of Yellowtail Dam on Bighorn River, 1.3 mi (2.1 km) upstream from Grapevine Creek, 15.5 mi (24.9 km) southeast of St. Xavier, and at mile 86.6 (139.3 km).

DRAINAGE AREA.--19,626 mi² (50,831 km²).

PERIOD OF RECORD.--November 1965 to current year (monthend contents only). Prior to October 1969, published as "Yellowtail Reservoir."

GAGE.--Water-stage recorder in powerhouse control room. Datum of gage is referenced to National Geodetic Vertical Datum of 1929 (levels by U.S. Bureau of Reclamation).

REMARKS.--Reservoir is formed by thin concrete-arch dam; construction began in 1961; completed in 1967. Storage began Nov. 3, 1965. Usable capacity, 1,356,000 acre-ft (1.67 km³) between elevation 3,296.50 ft (1,004.773 m), river outlet invert, and 3,657.00 ft (1,114.654 m), top of flood control. Elevation of spillway crest, 3,593.00 ft (1,095.146 m). Normal maximum operating level, 1,097,000 acre-ft (1.35 km³), elevation, 3,640.00 ft (1,109.472 m). Minimum operating level, 483,400 acre-ft (596 hm³), elevation 3,547.00 ft (1,081.126 m). Dead storage, 18,970 acre-ft (23.4 hm³) below elevation 3,296.50 ft (1,004.773 m). Figures given herein represent usable contents. Water is used for power production, flood control, irrigation, and recreation.

COOPERATION.--Elevations and capacity table furnished by U.S. Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily contents, 1,346,000 acre-ft (1.66 km³) July 6, 1967, elevation, 3,656.43 ft (1,114.480 m); minimum since first filling, 660,700 acre-ft (815 hm³) Mar. 11, 1970, elevation, 3,584.45 ft (1,092.540 m).

EXTREMES FOR CURRENT YEAR.--Maximum contents, 1,099,000 acre-ft (1.35 km³) Aug. 11, elevation, 3,640.17 ft (1,109.523 m); minimum, 724,400 acre-ft (893 hm³) May 19, elevation, 3,595.52 ft (1,095.914 m).

Month	Water-surface elevation, in feet	Contents*, in acre-feet	Change in contents, in acre-feet
September 30, 1981	3,634.92	1,036,000	
October 31	3,635.59	1,044,000	+ 8,000
November 30	3,631.13	996,100	-47,900
December 31	3,625.37	941,400	-54,700
January 31, 1982	3,615.77	863,500	-77,900
February 28	3,613.22	840,700	-22,800
March 31	3,609.53	817,000	-23,700
April 30	3,597.73	738,100	-78,900
May 31	3,600.60	756,400	+ 18,300
June 30	3,631.90	1,004,000	+247,600
July 31	3,639.38	1,089,000	+ 85,000
August 31	3,635.21	1,040,000	-49,000
September 30, 1982	3,635.52	1,043,000	+ 3,000

1982 water year + 7,000

* Does not include dead storage of 18,970 acre-ft (23.4 hm³).

MONTHLY SUMMARY OF CONTENTS FOR COMPACT RESERVOIRS EXISTING ON JANUARY 1, 1950

The extent, if any, of the use of reservoirs in this category which may be subject to Compact allocations was not determined. As a matter of hydrologic interest the month-end contents in acre-feet of four reservoirs are given. The first three reservoirs are in the Bighorn River basin, Wyoming, and data on contents were furnished by the U.S. Bureau of Reclamation. The Tongue River Reservoir in Montana is operated under the supervision of the Water Resources Division of the Montana Department of Natural Resources and Conservation, which furnished the operating data.

Contents, in acre-feet

Month	06224500 a/Bull Lake	b/Pilot Butte Reservoir	06281500 c/Buffalo Bill Reservoir	06307000 d/Tongue River Reservoir
September 30, 1981.	46,780	5,500	249,500	21,340
October 31.	44,370	8,520	228,300	20,080
November 30	46,680	8,460	223,800	21,760
December 31	48,420	8,430	226,300	19,540
January 31, 1982.	49,810	8,430	225,600	19,150
February 28	50,130	8,430	217,800	19,020
March 31.	50,260	17,260	207,400	18,500
April 30.	50,280	20,620	189,800	15,440
May 31.	42,940	4,910	217,800	24,740
June 30	93,750	14,790	411,600	63,300
July 31	147,100	23,940	438,300	57,000
August 31	141,100	20,140	414,600	37,010
September 30, 1982.	124,900	16,700	403,900	31,280
Change in contents during water year.	+78,120	+11,200	+154,400	+9,940

a/ Usable contents, from revised capacity table effective October 1, 1965. Dead storage is 722 acre-ft (890,000 m³).

b/ Usable contents. Dead storage is 5,360 acre-ft (6.61 hm³).

c/ Usable contents, from revised capacity table based on survey of 1959. Contents prior to October 1960 based on survey of 1941. Dead storage is negligible.

d/ Usable contents. Dead storage is 1,400 acre-ft (1.73 hm³). Contents based upon sedimentation surveys of October 1948.

RULES AND REGULATIONS FOR ADMINISTRATION OF
THE YELLOWSTONE RIVER COMPACT

A compact, known as the Yellowstone River Compact, between the States of Wyoming, Montana, and North Dakota, having become effective on October 30, 1951, upon approval of the Congress of the United States, which apportions the waters of certain interstate tributaries of the Yellowstone River which are available after the appropriative rights existing in the States of Wyoming and Montana on January 1, 1950, are supplied, and after appropriative rights to the use of necessary supplemental water are also supplied as specified in the Compact, the following rules and regulations are adopted subject to the provisions for amendment revision or abrogation as provided herein.

Article I. Collection of Water Records

- A. It shall be the joint and equal responsibility of the members of the States of Wyoming and Montana to collect, cause to be collected, or otherwise furnish records of tributary streamflow at the points of measurement specified in Article V (B) of the Compact, or as near thereto as is physically or economically feasible or justified.

1. Clarks Fork

The gaging station known as Clarks Fork near Silesia, Montana and located in NW1/4 SE1/4 sec. 1, T. 4 S., R. 23 E., shall be the point of measurement for the Clarks Fork.

2. Bighorn River (exclusive of Little Bighorn River)

The gaging station known as the Bighorn River at Bighorn, Montana, and located in NE1/4 NE1/4 sec. 33, T. 5 N., R. 34 E., shall temporarily be the designated point of measurement on that stream. The flow of the Little Bighorn River as measured at the gaging station near Hardin, Montana, and located in SW1/4 NW1/4 sec. 20, T. 1 S., R. 34 E., shall be considered the point of measurement for that stream, except that if or when satisfactory records are not available, the records for the nearest upstream station with practical corrections for intervening inflow or diversion shall be used.

3. Tongue River

The gaging station known as the Tongue River at Miles City, Montana, and located in SE1/4 sec. 23, T. 7 N., R. 47 E., shall temporarily be the point of measurement for that stream.

4. Powder River

The gaging station known as the Powder River near Locate, Montana, and located in SE1/4 sec. 23, T. 8 N., R. 51 E., shall temporarily be the designated point of measurement for that stream.

- B. Records of total annual diversion in acre-feet above the points of measurement designated in the Compact for irrigation, municipal, and industrial uses developed after January 1, 1950, shall be furnished by the members of the Commission for their respective States, at such time as the Commission deems necessary for interstate administration as provided by the terms of the Compact. Providing that if it be acceptable to the Commission, reasonable estimates thereof may be substituted.
- C. Annual records of the net change in storage in all reservoirs, not excluded under Article V (E) of the Compact, above the point of measurement specified in the Compact and completed after January 1, 1950, and the annual net change in reservoirs existing prior to January 1, 1950, which is used for irrigation, municipal, and industrial purposes developed after January 1, 1950, shall be the primary responsibility of the member of the Commission in whose State such works are located; providing such data are not furnished by Federal agencies under the provisions of Article III (D) of the Compact, or collected by the Commission.

Article II. Office and Officers

- A. The office of the Commission shall be located at the office of the Chairman of the Commission.
- B. The Chairman of the Commission shall be the Federal representative as provided in the Compact.
- C. The Secretary of the Commission shall be as provided for in Article III of these rules.
- D. The credentials of each member of the Commission shall be placed on file in the office of the Commission.

Article III. Secretary

- A. The Commission, subject to the approval of the Director of the United States Geological Survey, shall enter into cooperative agreements with the U.S. Geological Survey for such engineering and clerical services as may reasonably be necessary for the administration of the Compact. Said agreements shall provide that the Geological Survey shall:

1. Maintain and operate gaging stations at or near the points of measurement specified in Article V (A) of the Compact.
2. Assemble factual information on stream flow, diversion, and reservoir storage for the preparation of an annual report to the Governors of the signatory States.
3. Make such investigations and reports as may be requested by the Commission in aid of its administration of the Compact.

B. The Geological Survey shall act as Secretary to the Commission.

Article IV. Budget

- A. At the annual meeting of each even-numbered year or prior thereto, the Commission shall adopt a budget for operation during the ensuing biennium beginning July first. Such budget shall set forth the total cost of construction, maintenance and operation of gaging stations, the cost of engineering and clerical aid, and other necessary expenses excepting the salaries and personal expenses of the Commissioners. On odd-numbered years revisions of the budget shall be considered.
- B. It shall be the obligation of the Commissioners of the States of Montana and Wyoming to endeavor to secure from the Legislature of their respective States sufficient funds with which to meet the obligations of this Compact, except insofar as provided by the Federal government.

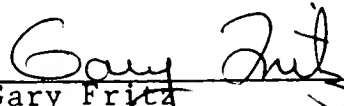
Article V. Meetings

An annual meeting of the Commission shall be held each November at some mutually agreeable point in the Yellowstone River Basin for consideration of the annual report for the water year ending the preceding September 30th, and for the transaction of such other business consistent with its authority; provided that by unanimous consent of the Commission the date and place of the annual meeting may be changed. Other meetings as may be deemed necessary shall be held at a time and place set by mutual agreement, for the transaction of any business consistent with its authority.


No action of the Commission shall be effective until approval by the Commissioners for the States of Wyoming and Montana.

Article VI. Amendments, Revisions and Abrogations.

The Rules and Regulations of the Commission may be amended or revised by a unanimous vote at any meeting of the Commission.




Gary Fritz
Commissioner for Montana



George L. Christopoulos
Commissioner for Wyoming

ATTESTED:



L. Grady Moore
Federal Representative

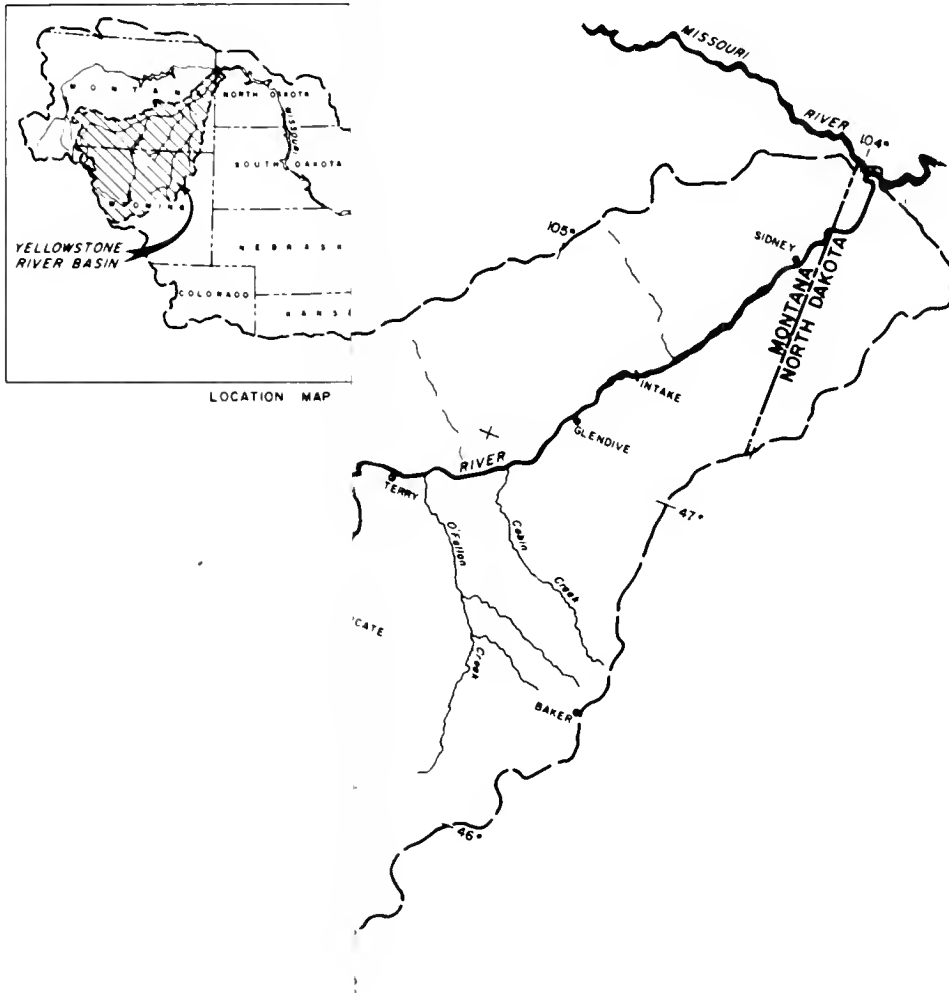
Adopted November 17, 1953
Amended April 9, 1980

METRIC CONVERSION TABLE

The following factors may be used to convert the inch-pound units published herein to the International System (SI) of metric units. Subsequent reports will contain both the inch-pound and SI unit equivalents in the station manuscript descriptions until such time that all data will be published in SI units.

<u>Multiply inch-pound units</u>	<u>By</u>	<u>To obtain SI units</u>
Length		
feet (ft)	.3048	meters (m)
miles (mi)	1.609	kilometers (km)
Area		
acres	4047	square meters (m ²)
	.4047	*hectares (ha)
	.4047	square hectometer (hm ²)
	.004047	square kilometers (km ²)
square miles (mi ²)	2.590	square kilometers (km ²)
Volume		
cfs-day (ft ³ /s-day)	2447	cubic meters (m ³)
	.002447	cubic hectometers (hm ³)
acre-feet (acre-ft)	1233	cubic meters (m ³)
	.001233	cubic hectometers (hm ³)
	.000001233	cubic kilometers (km ³)
Flow		
cubic feet per second (ft ³ /s)	28.32	liters per second (L/s)
	28.32	cubic decimeters per second (dm ³ /s)
	.02832	cubic meters per second (m ³ /s)

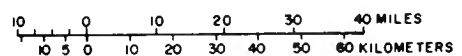
*The unit hectare is approved for use with the International System (SI) for a limited time. See NBS Special Bulletin 330, p. 15, 1972 edition.



YELLOWSTONE RIVER COMPACT COMMISSION YELLOWSTONE RIVER BASIN

EXPLANATION

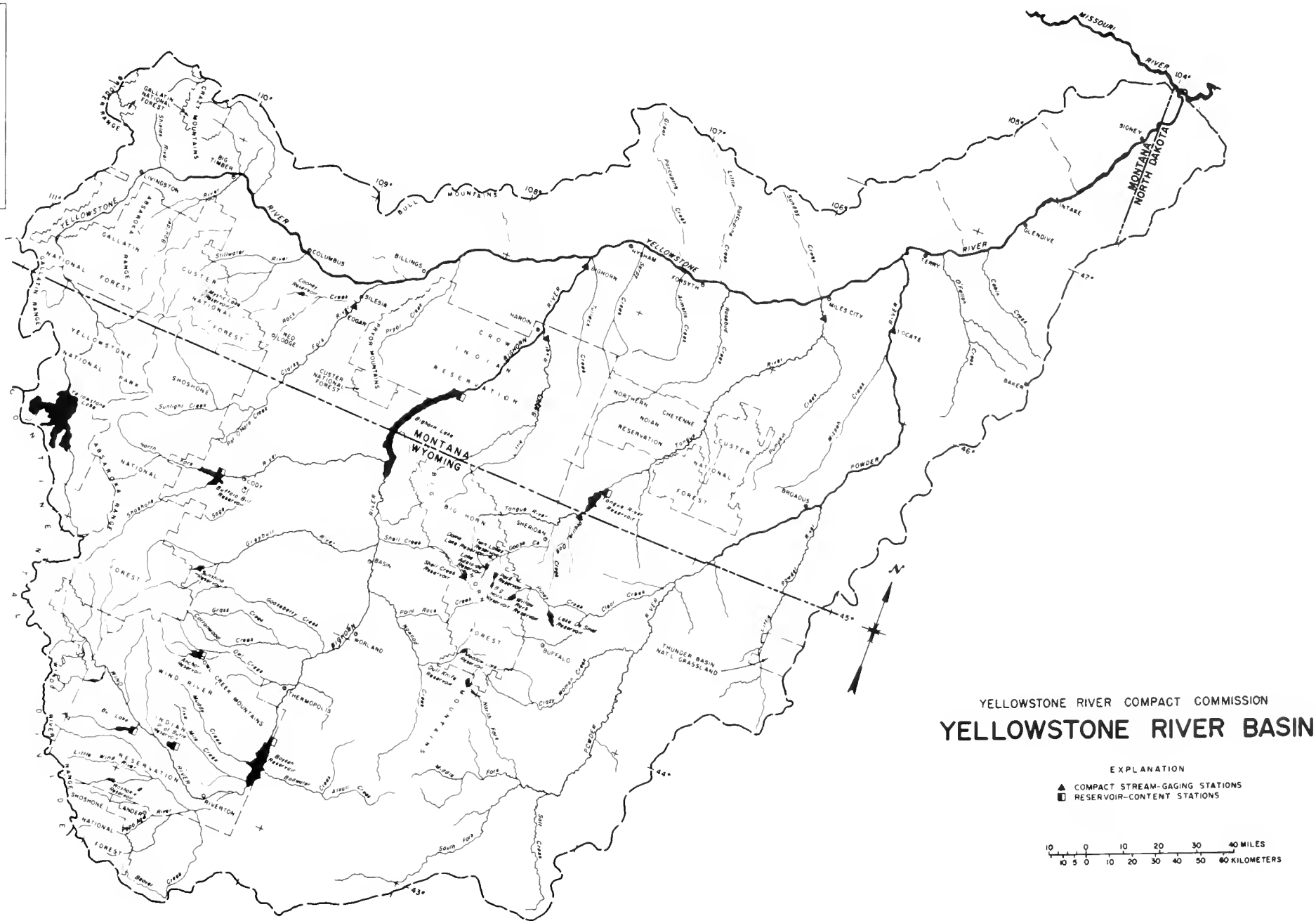
- ▲ COMPACT STREAM-GAGING STATIONS
- RESERVOIR-CONTENT STATIONS



MAP SHEETS



LOCATION MAP



YELLOWSTONE RIVER COMPACT COMMISSION
YELLOWSTONE RIVER BASIN

EXPLANATION
▲ COMPACT STREAM-GAGING STATIONS
■ RESERVOIR-CONTENT STATIONS

10 0 10 20 30 40 MILES
10 5 10 20 30 40 50 60 KILOMETERS

MAP SHOWING LOCATIONS OF COMPACT STREAM-GAGING AND RESERVOIR-CONTENT STATIONS

